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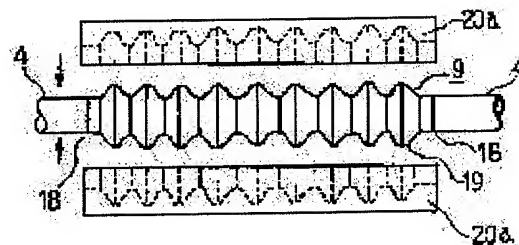
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(54) REFRIGERANT TUBE FOR CONDITIONER AND MANUFACTURE THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain the sufficient strength against the pressure resistance and bending stress by the sufficient absorption of the vibration of a refrigerant tube by covering the outer surface of the welded part of the uneven part of a flexible tube formed in bellows state to the refrigerant tube with an elastic member having an uneven inner surface corresponding to the uneven part and cylindrical outer surface without gap.

SOLUTION: The first valve of the outdoor unit of the air conditioner is connected to a compressor via a suction tube 4, and an accumulator and flexible tube 9 are provided in series on the way of the tube 4. The tube 9 is formed of stainless bellows tube, and connected to the tube 4 as a refrigerant tube via a welded part 18. An elastic member 20a of a urethane rubber is filled in and brought into close contact with the outsides of the bellows-like uneven part 19 of the tube 9 and welded part 18 to form the outsides flat. Thus, the tube 9 is reinforced without losing the flexibility, the strength and vibration absorbing properties are improved against the pressure resistant bending stress, and the corrosion of the part 18 is prevented.



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CLAIMS

[Claim(s)]

[Claim 1] Refrigerant piping for air conditioners for which the external surface of the concave heights of the flexible tube formed in the shape of bellows and a weld zone with refrigerant piping considers being covered without a clearance by the elastic member which has the concave heights inside and cylindrical external surface corresponding to the above-mentioned concave heights as the description in refrigerant piping for air conditioners for which the flexible tube was connected to the serial in the middle of refrigerant piping connected between the compressor and the exterior unit.

[Claim 2] Refrigerant piping for air conditioners according to claim 1 characterized by attaching in the concave heights outside of the above-mentioned flexible tube the division object in alignment with the longitudinal direction of a sleeve which has the concave heights inside which opposes the concave heights external surface of a flexible tube.

[Claim 3] The flexible tube formed in the shape of bellows, and refrigerant piping for air conditioners according to claim 1 characterized by preparing shock absorbing material without a clearance and sticking it.

[Claim 4] Refrigerant piping for air conditioners according to claim 1 characterized by preparing without a clearance the buffer made in the low elastic member, and sticking it from the sleeve of the elastic body of the method of outside in the clearance space of the flexible tube formed in the shape of bellows, and the sleeve of the elastic body which kept spacing in the method of the outside, and was arranged in the said alignment.

[Claim 5] Refrigerant piping for air conditioners characterized by having prepared the buffer without the clearance, and having stuck it and equipping the inside or the periphery section of an elastic member with the mesh for reinforcement to the clearance space of the flexible tube formed in the shape of bellows, and the sleeve of the elastic body which kept spacing in the method of the outside, and was arranged in the said alignment.

[Claim 6] Refrigerant piping for air conditioners according to claim 5 characterized by having prepared without the clearance the shock absorbing material made in the low elastic member, and sticking it from the sleeve of the elastic body of the method of outside.

[Claim 7] Refrigerant piping for air conditioners according to claim 5 or 6 whose sleeve is characterized by having elastic directivity by the shape of a cross-section rectangle.

[Claim 8] Refrigerant piping for air conditioners to which shock absorbing material is prepared in clearance space with the sleeve of the flexible tube formed in the shape of bellows, and the

elastic body with which spacing was kept in the method of the outside, and it was arranged in the shape of a cross-section rectangle without a clearance, and is stuck to it, and the sleeve is characterized by to have elastic directivity in the air conditioner by which the flexible tube was connected to the serial in the middle of refrigerant piping connected between the compressor and the change-over valve.

[Claim 9] A flexible tube is inserted in and equipped with ring-like low material in case low attachment welding of the refrigerant piping connected to a flexible tube and this flexible tube is carried out. Insertion connection of this edge is made at the edge of refrigerant piping at which it connects with a flexible tube. Low material After wearing immobilization, The manufacture approach of refrigerant piping for air conditioners which carries out low attachment welding by the RF low attachment approach, blowing off inert gas into refrigerant piping, and is characterized by making air blow off in refrigerant piping after low attachment welding termination.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to an air conditioner and relates to refrigerant piping for outdoor units and its manufacture approach of an air conditioner especially.

[0002]

[Description of the Prior Art] Generally the oscillating absorption section which prevents transmitting vibration of a compressor to each heat exchanger is prepared in the regurgitation piping section from the compressor and the communication trunk of an outdoor heat exchanger and indoor heat exchanger, i.e., inhalation piping to a compressor, and compressor of an outdoor unit of an air conditioner.

[0003] Drawing 15 is the perspective view showing the conventional piping structure shown in JP,61-54163,U. In drawing, 1 is a compressor, it is elastically supported by the base of a device through a vibroisolating material 2, and the change-over valves 3, such as a four way valve, are arranged in the upper part. 4 is inhalation piping which ties this change-over valve 3 and compressor 1, and, on the way, has connected the accumulator 5. Regurgitation piping whose 6 connects the above-mentioned compressor 1 and a change-over valve 3, and 7 and 8 are a suction pipe and a discharge tube, and the above-mentioned change-over valve 3 and a heat exchanger (not shown) are connected, and each of each [these] tubing is bent in the shape of a loop formation around the compressor 1.

[0004] Next, actuation is explained. A compressor 1 is made to drive, and if a refrigerant is made to compress and breathe out, vibration will occur in a compressor 1. For this reason, this vibration spreads through the inhalation piping 4 and the regurgitation piping 6, and reaches to a heat exchanger through the change-over valves 3, such as a four way valve. However, since each refrigerant piping has bent in the shape of a loop formation around a compressor 1, a

vibration isolating action is performed and vibration is decreased gradually.

[0005] With such conventional piping structure, the loop formation formed in piping increased, the die length of piping became long, oscillating resistance of a refrigerant not only increases, but the piping tooth space became large and there was a problem that the whole equipment was enlarged.

[0006] moreover, the resonance state whose loop formation formed in piping increases and the operating speed of a compressor and whose resonant frequency of the pipe line was alike and followed, the number of the resonant frequencies of the pipe line also became large, and corresponded depending on the operating speed of a compressor -- becoming -- an intermediary with a large vibration -- when the worst, it had led to breakage of piping. If there are many loop formations formed in piping when control to which the frequency of the input power of a compressor is changed and the operating speed of a compressor is changed especially is carried out, since the resonating frequency also increases, the design of a piping configuration and control of a compressor will become very difficult.

[0007] In the slot 10 of the shape of a spiral which formed the flexible tube 9 fabricated with elastic next door deoxidized copper tubing as second conventional example which solves such a problem, respectively, and was formed in this flexible tube 9 in the shape of bellows along with the longitudinal direction at the periphery section by casting processing And while being formed with a rigid high ingredient and permitting bending of the shaft orientations of the above-mentioned flexible tube 9 thru/or a longitudinal direction rather than an elasticity **** copper tube, the technique to the direction of a path by tubing internal pressure which bends, thru/or regulates deformation and raises the endurance of a flexible tube 9 as much as possible is indicated by drawing 16 thru/or drawing 18.

[0008] Next, actuation is explained. The refrigerant compressed by the compressor 1 is breathed out and transported to the regurgitation piping 6 connected to this. Although a refrigerant will be compressed, the change-over valves 3, such as a four way valve, will be reached through the regurgitation piping 6 and the inhalation piping 4 and it will be further spread to a discharge tube 8 and a suction pipe 7, since the flexible tube 9 is infixed in the discharge tube 8 and the suction pipe 7 like the above, vibration is absorbed by this flexible tube 9.

[0009] Therefore, the vibration from a compressor 1 being absorbed with a flexible tube 9, and being spread to an outdoor heat exchanger (not shown) is prevented. Since it was formed with elasticity next door deoxidized copper tubing, the spiral-like slot 10 was established in the periphery section in accordance with shaft orientations and the coil spring 11 has fitted in loosely, the telescopic motion to shaft orientations is permitted, and radial deformation is regulated, pressure resistance and fatigue strength are increased, and a flexible tube 9 improves endurance.

[0010] Moreover, a wire gauze is arranged in the periphery of the flexible tube which consists of metal bellows as third conventional example, the outside is further covered with the barrel which carried out the thinning of the center section, and the technique of controlling the curve posture of the metal accordion tube by vibration, and attaining reinforcement is indicated by JP,63-75453,A.

[0011] Moreover, drawing 19 is the perspective view showing the conventional low attachment approach shown in JP,4-172175,A, and the ring-like low material inserted in inhalation piping of the side which carries out low attachment of insertion side inhalation piping which carries out low attachment of the 4a, and the 4b, and which is inserted, and the edge of piping to which 12 is connected, and 13 are the electrodes for high-frequency induction heating at the time of RF low attachment which heats this ring-like low material part.

[0012] Next, an operation of the conventional low attachment approach is explained. Insert the ring-like low material 12 in the edge of piping 9, and approach the edge of piping 6b after insertion connection, this edge is made to approach this connection part at the heating electrode 13, and RF low attachment of the piping is carried out by heating a connection part and fusing the low material 12 according to the RF induced current which flows to a heating electrode.

[0013]

[Problem(s) to be Solved by the Invention] Since it is elasticity next door deoxidized copper

tubing, even if it is reinforced with the coil spring, using it by the air conditioner runs short of reinforcement, and work hardening generates a flexible tube in aging by vibration, and it becomes impossible however, for the conventional refrigerant piping for air conditioners to obtain enough flexible tubes, as shown in drawing 16 thru/or drawing 18.

[0014] Moreover, when a pressure is put on a flexible tube, for reinforcement by the coil spring, it changes to shaft orientations rather than radial, therefore the deformation over internal pressure becomes large. Furthermore, in the above-mentioned conventional example, although the direction of bending of vibration of piping of an air conditioner was originally larger than shaft orientations, since sufficient measures to bending vibration were not taken, it had the problem that stress increase of a flexible tube and destruction broke out.

[0015] Moreover, since clearance space is between the concave heights of a flexible tube, and a barrel in the conventional example of the above third, Since stress concentrates on the trough of bellows, or Yamabe locally, there is a trouble that distribution of stress is fully hard to be performed and the thinning of the center section of the rubber barrel is further carried out, when deformation force, such as bending, works, Since it became easy to fracture when a crack goes into a center section by a certain cause, it was not able to be said as perfectness in respect of dependability.

[0016] Moreover, since the conventional manufacture approach is constituted as mentioned above, piping serves as an elevated temperature by low attachment. Therefore, there was a problem that it was inapplicable to a component part to a weak pipe fitting at heat like the flexible tube which uses rubber etc.

[0017] This invention was made in order to solve the above problems, and it aims at offering the air conditioner which fully absorbed vibration of refrigerant piping connected to the compressor of an air conditioner, and attached refrigerant piping with sufficient reinforcement to pressure resistance and bending stress at constant cost.

[0018] Moreover, by the manufacture approach of this invention, it aims at acquiring the approach of manufacturing by which heat deterioration considered the weak flexible tube as refrigerant piping of high quality few with heat.

[0019]

[Means for Solving the Problem] refrigerant piping by which refrigerant piping for air conditioners concerning this invention was connected between the compressor and the exterior unit -- on the way -- the elastic member in which the external surface of the concave heights of the flexible tube formed in the shape of bellows and a weld zone with refrigerant piping has the concave heights inside and cylindrical external surface corresponding to the above-mentioned concave heights in refrigerant piping for air conditioners for which was resembled and the flexible tube was connected to the serial -- a clearance -- there is nothing -- **** -- it needs --
*****.

[0020] The division object in alignment with the longitudinal direction of a sleeve which has the concave heights inside which opposes the concave heights external surface of a flexible tube has attached and prepared refrigerant piping for air conditioners concerning this invention in the concave heights outside of the above-mentioned flexible tube.

[0021] Refrigerant piping for air conditioners concerning this invention prepares without a clearance the flexible tube formed in the shape of bellows, and shock absorbing material, and they are stuck to it.

[0022] From the sleeve of the elastic body of the method of outside, refrigerant piping for air conditioners concerning this invention prepares without a clearance the buffer made in the low elastic member, and it is stuck to it in the clearance space of the flexible tube formed in the shape of bellows, and the sleeve of the elastic body which kept spacing in the method of that outside, and was arranged in the said alignment.

[0023] To the clearance space of the flexible tube formed in the shape of bellows, and the sleeve of the elastic body which kept spacing in the method of that outside, and was arranged in the said alignment, refrigerant piping for air conditioners concerning this invention prepares a buffer without a clearance, and it is stuck to it, and it equips the inside or the periphery section of an elastic member with the mesh for reinforcement.

[0024] From the sleeve of the elastic body of the method of outside, refrigerant piping for air conditioners concerning this invention prepares without a clearance the buffer made in the low elastic member, and it is stuck to it.

[0025] As for refrigerant piping for air conditioners concerning this invention, the sleeve has elastic directivity by the shape of a cross-section rectangle.

[0026] In the middle of refrigerant piping connected between the compressor and the change-over valve, refrigerant piping for air conditioners concerning this invention prepares shock absorbing material in the clearance space of the flexible tube formed in the shape of bellows, and the sleeve which kept spacing in the method of that outside, and has been arranged in the shape of a cross-section rectangle without a clearance, sticks it to it in the air conditioner by which the flexible tube was connected to the serial, and has directivity with that elastic sleeve.

[0027] The manufacture approach of refrigerant piping for air conditioners concerning this invention A flexible tube is inserted in and equipped with ring-like low material in case low attachment welding of the refrigerant piping connected to a flexible tube and this flexible tube is carried out. Insertion connection is made at the edge of refrigerant piping at which this edge is connected to a flexible tube, low attachment welding of the low material is carried out by the RF low attachment approach, blowing off inert gas after wearing immobilization and into refrigerant piping, and air is made to blow off in refrigerant piping after low attachment welding termination.

[0028]

[Embodiment of the Invention]

That gestalt 1. drawing 1 of operation indicated refrigerant piping of the compressor circumference of the outdoor unit of the air conditioner of this invention to be, and drawing 2 are the enlarged drawings showing the cross section of a flexible tube, and 14 is the outdoor unit base of an air conditioner, and is carrying out installation support of the compressor 1 elastically by the vibroisolating material 2. 15 is the first bulb of this outdoor unit, and the inhalation piping 4 connects with the compressor 1, and, on the way, it has formed the accumulator 5 and the flexible tube 9 in the serial. 16 is an outdoor heat exchanger and is connected with the compressor by the regurgitation piping 6. 17 is bellows tubing made from the stainless steel of the above-mentioned flexible tube 9, and is connected to the inhalation piping 4 as refrigerant piping by the weld zone 18. 19 is bellows-like concave heights, the outside of these concave heights and the above-mentioned weld zone 18 is filled up with the elastic members 20, such as polyurethane rubber, and it sticks, and flattening of that outside is smoothly carried out like a cylindrical shape.
 [0029] Next, actuation is explained. In drawing 1 and drawing 2, a compressor 1 and vibration reach propagation and a flexible tube 9 in an accumulator 5 and the inhalation piping 4 as refrigerant piping. However, the vibration becomes quite small compared with vibration generated in the compressor 1. Therefore, vibration of the outdoor unit of an air conditioner will be reduced more sharply than the outdoor unit which is not using the flexible tube 9, as shown in drawing 11. Moreover, although stress concentration happens according to deformation only with the bellows tubing 17 made from stainless steel although the elongation of shaft orientations arises and plastic deformation or destruction arises when a flexible tube 9 is filled up with a refrigerant, it distributes without stress concentrating on a specific part by the elastic member 20 which is polyurethane rubber prepared in the bellows-like concave heights 19 exterior of a flexible tube 9 without the clearance, and the elongation of a flexible tube 9 can be regulated.

[0030] About deformation of the direction of bending, sufficient flexibility required for oscillating absorption is acquired by the elastic member 20 which is the above-mentioned polyurethane rubber. Therefore, vibration of a compressor 1 is absorbed by the flexibility of the direction of bending, with the pressure resistance over fluid pressure maintained. Moreover, the periodic-damping ratio at the time of vibration also goes up by the internal damping of the elastic member 20 which is polyurethane rubber, and the effectiveness same with having attached the periodic-damping machine in the flexible tube 9 is acquired. Therefore, with the gestalt 1 of implementation of this invention, the die length of refrigerant piping can be shortened, and since the tooth space which moreover arranges refrigerant piping can be made small, the miniaturization of an outdoor unit is attained. Furthermore, since it covers by the elastic member

20 whose weld zone 18 is also polyurethane rubber, a weld zone 18 can be intercepted from the matter which shortens moisture and the other lives of the open air, and corrosion etc. can be prevented.

[0031] With the gestalt 1 of implementation of this invention, although the specification of the flexible tube is carried out to inhalation piping, a flexible tube may be connected to both regurgitation piping or regurgitation piping, and inhalation piping at a serial. Furthermore, although the specification of the polyurethane rubber is carried out as an elastic member, the same effectiveness can be acquired even if it uses a styrene rubber or silicone rubber.

[0032] Gestalt 2. drawing 3 and drawing 4 of operation are the side elevation showing the decomposition side elevation and outline of a flexible tube which show the gestalt 2 of implementation of this invention. 20a has concave heights 19 inside which was divided along with the longitudinal direction of the sleeve made of rubber and which is the segmenter and opposes the external surface of the weld zone 18 with the inhalation piping 4 as bellows-like flexible-tube 9 concave heights 19 outside and refrigerant piping made from stainless steel for 2 minutes at the above-mentioned concave heights 19, and is attached in concave heights 19 outside without the clearance at the adhesion condition.

[0033] Next, actuation is explained. When a flexible tube 9 is filled up with a refrigerant and internal pressure is applied, it distributes without being stopped by the polyurethane rubber 20 whose elongation of the shaft orientations of a flexible tube 9 is the sleeve made of rubber, for example, an elastic member, and the stress of a flexible tube 9 concentrating on a specific part, and the pressure resistance of a flexible tube 9 can be raised. Moreover, the polyurethane rubber 20 which is an elastic member can distribute, and the stress by vibration can also avoid the stress concentration by vibration, and can prevent destruction. Moreover, the periodic-damping ratio at the time of vibration also goes up by the internal damping of the elastic member 20 which is polyurethane rubber, and there is the same effectiveness as the case where a periodic-damping machine is attached to a flexible tube. Therefore, the die length of refrigerant piping can be shortened, and while the tooth space which moreover arranges refrigerant piping is small, and ends and the miniaturization of a unit of it is attained, a division object can be cheaply mass-produced with metal mold, and an attachment activity is also easy and it has the effectiveness of lowering cost.

[0034] With the gestalt 2 of this operation, although the specification of the polyurethane rubber is carried out as an elastic member, even if it uses a styrene rubber, nitrile rubber, clo lob RENGOMU, or silicone rubber, the same effectiveness can obtain. Moreover, trichotomy or a quadrisection object is sufficient as a division object.

[0035] Furthermore, with the gestalt 2 of this operation, although the specification of the flexible tube is carried out to inhalation piping, a flexible tube may be connected with both regurgitation piping or regurgitation piping, and inhalation piping at a serial. Although the outside is carrying out the specification of the thing of a cylindrical shape with the gestalt 2 of implementation of this invention, of course, bellows is sufficient further again.

[0036] The side elevation in which example 3. drawing 5 shows the outline of the flexible tube of the gestalt 3 of implementation of this invention, and drawing 6 are the explanatory views showing the production process of this flexible tube. To the flexible tube 9 made from stainless steel welded to the inhalation piping 4 as refrigerant piping in drawing 6 The sleeve 21 made of nitrile rubber is beforehand arranged in the said alignment more greatly than the outer diameter of a flexible tube 9. The raw material which mixed shock absorbing material to the clearance space of a flexible tube 9 and the sleeve 21 made of nitrile rubber, and mixed the chain elongation agent and the cross linking agent to liquefied polyurethane rubber 20 is poured in. If it is made to harden, as shown in drawing 5, what packing of the elastic member 20 which is polyurethane rubber prepared in clearance space with the sleeve 21 made of nitrile rubber without the clearance will be obtained.

[0037] Next, actuation is explained. When a flexible tube 9 is filled up with a refrigerant and internal pressure is added, it is stopped by the elastic member 20 whose elongation of a flexible tube 9 is the sleeve 21 made of nitrile rubber, and polyurethane rubber, and the stress of a flexible tube 9 does not concentrate on a particular part, but is distributed, and pressure-

proofing of a flexible tube 9 can be raised. Moreover, the elastic member 20 whose stress by vibration is also polyurethane rubber, and the sleeve 21 made of nitrile rubber distribute, and the stress concentration by vibration and destruction can be prevented. Furthermore, the flexible tube 9 required for oscillating absorption can be reinforced by carrying out the specification of the elastic member 20 and the sleeve 21 made of nitrile rubber which are polyurethane rubber. The periodic-damping ratio at the time of vibration also goes up further again by the internal damping of the elastic member 20 which is polyurethane rubber, and the sleeve 21 made of nitrile rubber, and the effectiveness same with having attached the periodic-damping machine in the flexible tube 9 is acquired. Therefore, the die length of refrigerant piping can be shortened, and since the tooth space which moreover arranges refrigerant piping is small and ends, the miniaturization of a unit is attained.

[0038] Moreover, with the gestalt 3 of implementation of this invention, without needing big metal mold, since packing of polyurethane rubber can be obtained by impregnation of liquefied polyurethane rubber according to the configuration of a flexible tube, and a dimension, the flexible tube of the low cost which could manufacture using the terminal seal member and was excellent in pressure-proofing and oscillating absorptivity can be obtained, and, therefore, the air conditioner of low cost can be offered.

[0039] Furthermore, with the gestalt 3 of implementation of this invention, although the specification of polyurethane rubber and the nitrile rubber is carried out, even if it transposes to a styrene rubber, clo lob RENGOMU, isobutylene isoprene rubber, or silicone rubber, the same effectiveness can be acquired.

[0040] Although formed in clearance space with the sleeve 21 made of nitrile rubber which set spacing to the flexible tube and the method of that outside, and was arranged in the said alignment with the packing of polyurethane rubber with the gestalt 3 of the gestalt 4. above-mentioned implementation of operation, the gestalt 4 of implementation of this invention set up more firmly than polyurethane rubber 20 degree of hardness hardening of the sleeve 21 made of nitrile rubber especially, and the usual rubber degree of hardness is chosen in 50 - 80 degrees.

[0041] Thereby, the deformation at the time of the pressure load of a flexible tube 9 can be regulated with the sleeve 21 made of nitrile rubber, and pressure resistance can be raised. Moreover, oscillating absorptivity can be improved by the polyurethane rubber 20 poured into the interior. Furthermore, it can be used on broad conditions by choosing suitably the ratio of the degree of hardness of the polyurethane rubber 20 poured into the sleeve 21 made of nitrile rubber, and the interior according to a service condition.

[0042] With the gestalt 3 of the gestalt 5. above-mentioned implementation of operation, or the gestalt 4 of operation, although the sleeve 21 made of nitrile rubber which set spacing to the flexible tube 9 made from stainless steel and the method of the outside, and was arranged in the said alignment is a thing cylindrical-bottom-less type, as shown in drawing 7, it prepares without a clearance packing of the elastic member 20 which is polyurethane rubber in the clearance space of a flexible tube 9 and sleeve 21 made of bottoming nitrile rubber a, and is formed in it.

[0043] With the gestalt 5 of implementation of this invention, since a terminal seal member can be abolished, it has the effectiveness it is ineffective to it being possible for a production process to decrease, and to be able to obtain the flexible tube of low cost, and to offer the air conditioner of low cost.

[0044] Gestalt 6. drawing 8 of operation is the sectional side elevation showing the outline of the flexible tube of the gestalt 6 of this operation. As shown in drawing 8, to the flexible tube 9 made from stainless steel welded to the inhalation piping 4 as refrigerant piping The sleeve 21 made of nitrile rubber reinforced with the mesh 22 of the product [it is larger than the outer diameter of a flexible tube 9, and / inside] made of a mesh, for example, rubber, is beforehand arranged in the said alignment. If the clearance space of a flexible tube 9 and the sleeve 21 made of nitrile rubber is made to pour in and harden the raw material which mixed the chain elongation agent and the cross linking agent to the liquefied polyurethane rubber 20 which is an elastic member What packing of the elastic member 20 which is polyurethane rubber had prepared in the clearance space of the sleeve 21 made of nitrile rubber and a flexible tube 9 without the clearance is obtained.

[0045] Next, actuation is explained. A flexible tube 9 is filled up with a refrigerant, when internal pressure is added, it is stopped by the nitrile rubber from which the elongation of a flexible tube 9 was reinforced with the mesh 22 made of rubber, and stress does not concentrate, but is distributed by the particular part of a flexible tube 9, and the pressure resistance of a flexible tube 9 can be improved. Furthermore, since the sleeve 21 made of nitrile rubber is reinforced with the mesh 22 made of rubber, pressure resistance still higher than the structure which combined the sleeve 21 and polyurethane rubber 20 made of nitrile rubber of the gestalt 3 of operation and the gestalt 4 of operation can be acquired.

[0046] Moreover, polyurethane rubber 20 distributes and the stress by vibration can also prevent the stress concentration by vibration, and destruction. Furthermore, the periodic-damping ratio at the time of vibration also goes up by the internal damping of polyurethane rubber 20, and there is effectiveness equivalent to the case where a periodic-damping machine is attached to a flexible tube 9. Therefore, the die length of refrigerant piping can be shortened, the tooth space which moreover arranges refrigerant piping is small, and ends, and the miniaturization of a unit of it is attained. Moreover, since it can manufacture without being able to obtain packing of polyurethane rubber 20 and needing big metal mold by impregnation of liquefied polyurethane rubber 20 according to the configuration of a flexible tube 9, and a dimension with the gestalt 6 of this operation, the flexible tube of the low cost excellent in pressure-proofing and oscillating absorptivity can be obtained, and the air conditioner of low cost can be offered.

[0047] Gestalt 7. drawing 9 of operation is the perspective view showing the outline of the sleeve made of nitrile rubber which constitutes some flexible tubes of the gestalt 7 of this operation. 23 is a sleeve made of the nitrile rubber of a cross-section rectangle configuration, sets spacing to the flexible tube 9 in the gestalten 3, 4, and 5 of operation, or the gestalt 6 of operation, and the method of the outside, and, unlike the sleeve 21 made of nitrile rubber arranged in the said alignment, has the elastic direction.

[0048] Next, actuation is explained. Vibration of a compressor is as small as vibration of a normal or the vertical direction can be disregarded with about 0.05, when vibration of the connection direction is set to 1. Thus, if only one direction has flexibility, vibration generated in the compressor 1 is decreased, effectiveness which is clear to the unit vibration level comparison shown in drawing 13 is acquired, and vibration of the outdoor unit of an air conditioner can be reduced more sharply than the outdoor unit which is not using the flexible tube. moreover, the case where vibration of the disturbance under transportation etc. is received since what is necessary is to have had only the flexibility which can fully absorb vibration of a compressor in the required direction — the configuration of the gestalt 7 of this operation — **** — if it is, since an unnecessary vibration can be suppressed, effect which it has on other refrigerant pipe fittings can be lessened, and improvement in the dependability of an outdoor unit can be aimed at.

[0049] Moreover, although the elongation of shaft orientations arises when a flexible tube 9 is filled up with a refrigerant, only in the flexible tube 9 made from stainless steel, according to deformation, stress concentration happens and plastic deformation or destruction arises. However, it distributes without stress concentrating on a specific part by the polyurethane rubber 20 prepared in the concave heights 17 exterior of a flexible tube 9 without the clearance, and the elongation of a flexible tube 9 can be regulated. About the direction of bending, sufficient flexibility required for oscillating absorption is acquired by the above-mentioned polyurethane rubber 20. Therefore, vibration of a compressor 1 is absorbed by the flexibility of the direction of bending, with pressure resistance maintained.

[0050] It is the sectional view in which gestalt 8. drawing 10 of operation is the refrigerant piping diagram of the compressor circumference of the outdoor unit of an air conditioner, drawing 11 is the plan of drawing 10, and drawing 12 (a) shows the flexible tube of the gestalt 8 of this operation. Drawing 12 (b) is the side elevation showing the outline of the flexible tube of the gestalt 8 of this operation. In drawing, 14 is the outdoor unit base of an air conditioner, and it is connected on the way with the change-over valves 3, such as a four way valve, by the inhalation piping 4 through the accumulator 5 in the compressor 1 while it is carrying out installation support of the compressor 1 elastically by the vibroisolating material 2. Moreover, a compressor

1 and the change-over valves 3, such as a four way valve, are connected by the regurgitation piping 6. Furthermore, the suction pipe 7 and discharge tube 8 which are connected to the heat exchanger which is not illustrated are connected to the change-over valves 3, such as a four way valve. 17 is bellows tubing made from the stainless steel of the above-mentioned flexible tube 9, and is connected to the inhalation piping 4 as refrigerant piping by the weld zone 18. It is the sleeve made of nitrile rubber of the shape of a cross-section rectangle arranged so that the flexible tube 9 in which 19 was formed in of the concave heights on bellows, and 23 was formed with the above-mentioned bellows tubing 17 made from stainless steel might be wrapped in, and while it is short in the connection direction of a compressor 1 and accomplishing the direction of a normal for a long time, lock out side 23c was formed in one side, and the polyurethane rubber 20 which is an elastic member without a clearance filled up the clearance between the bellows-like concave heights 19 of a flexible tube 9, and it has prepared in it.

[0051] Next, actuation is explained. Vibration of a compressor 1 reaches propagation and a flexible tube 9 in an accumulator 5. Since vibration of a compressor 1 is as small as vibration of the normal or the vertical direction of the oscillating smallness of a compressor, i.e., the direction, can be disregarded with about 0.05 when vibration of the tangential direction of the oscillating size of a compressor 1, i.e., the direction, is set to 1, as shown in drawing 11 If it becomes the direction of flexible smallness and only one direction has flexibility, the direction of an arrow head of a the direction of a flexible size, and the direction of an arrow head of b Vibration generated in the compressor 1 is decreased and vibration of the outdoor unit of an air conditioner can be reduced more sharply than the outdoor unit which the almost same effectiveness as the unit vibration level comparison table shown in drawing 13 is acquired, and is not using the flexible tube.

[0052] Therefore, a flexible tube is connected to a serial in the middle of refrigerant piping connected between a compressor and change-over valves, such as a four way valve, with the gestalt 8 of implementation of this invention. And since the connection direction of the oscillating size of a compressor, i.e., the direction, is used as a cross-section rectangle-like short hand at a compressor and the normal of a compressor or the vertical direction of the oscillating smallness of a compressor, i.e., the direction, is arranged as cross-section rectangle-like straight side Since it has the direction where the sleeve itself is elastic, while being able to reinforce a flexible tube and making good the reinforcement and oscillating absorptivity over pressure resistance and bending stress, without losing the flexibility of bending of a required direction The die length of refrigerant piping can be shortened, and since the tooth space which moreover arranges refrigerant piping can be made small, it has the effectiveness whose miniaturization of a unit is attained.

[0053] Furthermore, without needing big metal mold, since packing which it is by impregnation of liquefied polyurethane rubber, and is elastic members, such as polyurethane rubber, can be obtained according to the configuration of a flexible tube, and a dimension, it can manufacture easily using a terminal seal member, the flexible tube excellent in pressure resistance and oscillating absorptivity can be obtained by low cost, and it has the effectiveness of offering the air conditioner of low cost.

[0054] Moreover, it is ***** to be able to lessen effect which it has on other refrigerant pipe fittings, and to aim at improvement in the dependability of a unit, since an unnecessary vibration can be suppressed when vibration of the disturbance under transportation etc. is received, since what is necessary is to have only the flexibility which can fully absorb vibration of a compressor in the required direction with the gestalt 8 of implementation of this invention.

[0055] Furthermore, with the gestalt 8 of implementation of this invention, although the flexible tube is used for a part of inhalation piping, a flexible tube may be connected to both regurgitation piping or regurgitation piping, and inhalation piping at a serial.

[0056] The gestalt 9 of implementation of this invention is explained about drawing below gestalt 9. of operation. In drawing 14 , the inactive gas nozzle to which the flexible tube according [9] to the gestalt 1 of the above-mentioned implementation thru/or the gestalt 8 of operation, piping for which 4 is connected to this flexible tube 9, the ring-like low material by which 12 is inserted in the edge of the above-mentioned flexible tube 9, and 13 spout the electrode for high-

frequency induction heating at the time of RF low attachment in piping, and 24 spouts inert gas, and 25 are air nozzles which spout cooling air towards a flexible tube 9 after RF low attachment termination. The exterior serves as the configuration where the inhalation piping 4 clung, to the both ends of cylinder-like rubber section 20a, and a flexible tube 9 has [as opposed to / especially / heat] weak rubber section 20a.

[0057] Hereafter, an operation is explained. First, the ring-like low material 12 is inserted in the insertion side 4a edge of the inhalation piping 4 of flexible-tube 9 both ends. Insertion connection is made at the edge of inhalation piping 4b of the side in which this edge is inserted. At this time, the ring-like low material 12 is fixed so that the end face of inhalation piping 4b may be hit. Next, the connected inhalation piping 4a and 4b is arranged to the high-frequency-induction-heating electrode 13. At this time, the high-frequency-induction-heating electrode 13 is arranged around a piping insertion connection.

[0058] Next, the inactive gas nozzle 24 is arranged so that inert gas can be spouted in the inhalation piping 4. First, it blows off and inert gas is made into the condition that inert gas was full in piping. This prevents oxidation by the heat of a flexible-tube 9 inside front face. And high-frequency heating is carried out with the high-frequency-induction-heating electrode 12. Thereby, since only the connection parts of a flexible tube 9 and the inhalation piping 4 are heated locally, low attachment is carried out, without heating rubber section 20a.

[0059] Air is spouted after low attachment termination until piping is immediately cooled towards the inhalation piping 4 of a flexible tube 9 from the cooling air nozzle 25. Migration of the heat from the connection part of the flexible tube 9 and the inhalation piping 4 by which low attachment was carried out by this to an elastic member 20 is lessened, and a flexible tube 9 is protected.

[0060] Although the gestalt 9 of gestalt 10. of operation and the above-mentioned implementation explained low attachment of a flexible tube 9, the same effectiveness as the gestalt 9 of the above-mentioned implementation is done so also about low attachment of a weak device to heat. Moreover, when a high-frequency-induction-heating process automates, there is little dispersion in low attachment and it can carry out.

[0061] Even if it becomes with the structure where of insertion side piping 4a of a flexible tube 9 and piping 4b of the side inserted are connected to the gestalt 11. pan of operation on the contrary although the ring-like low material 12 is inserted in the inhalation piping 4a edge of a flexible tube 9 and insertion connection of this inhalation piping 4a edge is made at the edge of inhalation piping 4b with the gestalt 9 of operation, effectiveness equivalent to the gestalt 9 of the above-mentioned implementation is done so.

[0062]

[Effect of the Invention] Refrigerant piping for air conditioners concerning claim 1 of this invention hereafter In refrigerant piping for air conditioners for which the flexible tube was connected to the serial in the middle of refrigerant piping connected between the compressor and the exterior unit Since the external surface of the concave heights of the flexible tube formed in the shape of bellows and a weld zone with refrigerant piping considered as the configuration covered without the clearance by the elastic member which has the concave heights inside and cylindrical external surface corresponding to the above-mentioned concave heights While reinforcing a flexible tube, improving reinforcement and oscillating absorptivity to proof-pressure bending stress and being able to shorten the die length of refrigerant piping, without losing flexibility, it has the effectiveness which corrosion etc. stops being able to generate easily in a weld zone.

[0063] Refrigerant piping for air conditioners concerning claim 2 of this invention Since the division object in alignment with the longitudinal direction of a sleeve which has the concave heights inside which opposes the concave heights external surface of a flexible tube considered as the configuration currently attached in the concave heights outside of the above-mentioned flexible tube Since the division object in alignment with the longitudinal direction of the pipe made of nitrile rubber which has a concave heights inside has high productivity and an attachment activity is also easy, it has the effectiveness of reducing a manufacturing cost.

[0064] Refrigerant piping for air conditioners concerning claim 3 of this invention has the

effectiveness of raising productivity and obtaining the flexible tube formed in the shape of bellows, and the flexible tube which was excellent in pressure resistance and oscillating absorptivity since it considered as the configuration to which shock absorbing material is prepared without a clearance, and is stuck and shock absorbing material was prepared according to the configuration of a flexible tube, and the dimension by low cost.

[0065] Refrigerant piping for air conditioners concerning claim 4 of this invention Since it considered as the configuration to which the buffer made in the low elastic member is prepared without a clearance, and is stuck from the sleeve of the elastic body of the method of outside in the clearance space of the flexible tube formed in the shape of bellows, and the sleeve of the elastic body which kept spacing in the method of the outside, and was arranged in the said alignment While it comes out to obtain packing of the buffer of low elasticity from the sleeve of an elastic body, it has the effectiveness of excelling in pressure resistance and oscillating absorptivity, and raising productivity, and obtaining the flexible tube of low cost.

[0066] Refrigerant piping for air conditioners concerning claim 5 of this invention To the clearance space of the flexible tube formed in the shape of bellows, and the sleeve of the elastic body which kept spacing in the method of the outside, and was arranged in the said alignment Since it considered as the configuration which the buffer was prepared without the clearance, and was stuck and equipped the inside or the periphery section of an elastic member with the mesh for reinforcement It has the effectiveness which reinforces a flexible tube, improves pressure resistance, the strength property over bending stress, and oscillating absorptivity, can shorten the die length of refrigerant piping, makes small the tooth space which arranges [whether it is also ** or] refrigerant piping, and enables the miniaturization of a unit, without losing flexibility.

[0067] Refrigerant piping for air conditioners concerning claim 6 of this invention has the effectiveness of excelling in pressure resistance and oscillating absorptivity, and raising productivity, and obtaining the flexible tube of low cost while it comes out to obtain packing of the buffer of low elasticity from the sleeve of an elastic body, since it considered as the configuration to which the buffer made in the low elastic member is prepared without a clearance, and is stuck from the sleeve of the elastic body of the method of outside.

[0068] Since the sleeve considered as the configuration which has elastic directivity by the shape of a cross-section rectangle, even when vibration of the disturbance under transportation etc. is received, refrigerant piping for air conditioners concerning claim 7 of this invention can suppress an unnecessary vibration, and can lessen effect which it has on other refrigerant pipe fittings, and can aim at improvement in the dependability of an outdoor unit.

[0069] Refrigerant piping for air conditioners concerning claim 8 of this invention In the air conditioner by which the flexible tube was connected to the serial in the middle of refrigerant piping connected between the compressor and the four way valve Since shock absorbing material is prepared in the clearance space of the flexible tube formed in the shape of bellows, and the sleeve which kept spacing in the method of the outside, and has been arranged in the shape of a cross-section rectangle without a clearance, and was stuck to it and the sleeve considered as the configuration which has elastic directivity Since it has the direction where the sleeve itself is elastic, reinforcement of a flexible tube can be performed without losing the flexibility of bending of a required direction. Pressure-resistant oscillating absorptivity is made good and the die length of refrigerant piping is shortened, and since the tooth space which moreover arranges refrigerant piping can be made small, it has the effectiveness which enables the miniaturization of a unit.

[0070] The manufacture approach of refrigerant piping for air conditioners concerning claim 9 of this invention A flexible tube is inserted in and equipped with ring-like low material in case low attachment welding of the refrigerant piping connected to a flexible tube and this flexible tube is carried out. Insertion connection of this edge is made at the edge of refrigerant piping at which it connects with a flexible tube. Low material After wearing immobilization, Since low attachment welding was carried out by the RF low attachment approach and it considered as the approach of spouting air in refrigerant piping after low attachment welding termination, blowing off inert gas into refrigerant piping It is effective in carrying out low attachment welding and being able to

manufacture ** and heat deterioration in the condition with little dispersion, while heat to ** also lessens a weak flexible tube to heat.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The outline perspective view showing refrigerant piping for air conditioners by the gestalt 1 of implementation of this invention.

[Drawing 2] The sectional side elevation showing the flexible tube by the gestalt 1 of implementation of this invention.

[Drawing 3] The decomposition perspective view showing the flexible tube by the gestalt 2 of implementation of this invention.

[Drawing 4] The sectional side elevation showing the flexible tube by the gestalt 2 of implementation of this invention.

[Drawing 5] The sectional side elevation showing the flexible tube by the gestalt 3 of implementation of this invention, or the gestalt 4 of operation.

[Drawing 6] The explanatory view which carries out tubing to manufacture of the flexible tube by the gestalt 3 of implementation of this invention.

[Drawing 7] The side elevation showing the flexible tube by the gestalt 5 of implementation of this invention.

[Drawing 8] The side elevation showing the flexible tube by the gestalt 6 of implementation of this invention.

[Drawing 9] The perspective view showing the sleeve of the flexible tube by the gestalt 7 of implementation of this invention.

[Drawing 10] The important section side elevation showing refrigerant piping for air conditioners by the gestalt 8 of implementation of this invention.

[Drawing 11] The plan showing refrigerant piping for air conditioners of drawing 10 .

[Drawing 12] a is the front view showing the flexible tube by the gestalt 8 of implementation of this invention. b is the important section side elevation showing the flexible tube by the gestalt 8 of implementation of this invention.

[Drawing 13] The related Fig. showing the unit vibration level comparison at the time of using the gestalt 1 of implementation of this invention.

[Drawing 14] The front view of the low attachment condition of refrigerant piping for air conditioners which shows the gestalt 9 of implementation of this invention.

[Drawing 15] The perspective view in which cutting and lacking a part of air conditioner by the first conventional example of this invention, and showing refrigerant piping.

[Drawing 16] The perspective view in which cutting and lacking a part of air conditioner by the second conventional example of this invention, and showing refrigerant piping.

[Drawing 17] The side elevation showing the flexible tube by the conventional example of this invention.

[Drawing 18] The sectional side elevation showing the important section of the flexible tube of drawing 17 .

[Drawing 19] The perspective view showing the conventional low attachment approach.

[Description of Notations]

1 Compressor, 3 Change-over Valve, 9 Flexible Tube, 12 Ring-like Low Material, 13 Electrode for High Frequency Induction Heating, 17 Bellows Tubing, 18 Weld Zone, 19 Concave Heights, 20 Elastic Member, 21 Sleeve made of Nitrile Rubber, 22 Mesh, 23 Cross-Section Rectangle-like Sleeve, 24 Inactive Gas Nozzle, 25 Air Nozzle

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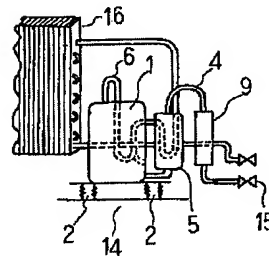
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(54) 【発明の名称】 空気調和機用冷媒配管及びその製造方法

(57) 【要約】

【課題】 この発明は空気調和機用冷媒配管の可撓管に係り、冷媒配管の圧縮機に発生する振動を吸収するため、冷媒配管を長くしコスト高で大型の室外ユニットを提供せざるを得なかった、このため、振動を吸収し低コストで小型化した室内ユニットを提供することを目的とする。

【解決手段】 圧縮機1と室外ユニットのバルブ15との間に接続された冷媒配管の途中にベローズ状の可撓管9を直列に接続し、この可撓管9の凹凸部19および冷媒配管との溶接部18の外面を上記凹凸部19に対応する凹凸部19内面と円筒形外面とを有するゴム20により隙間なくカバーする。



- 1: 圧縮機
- 2: 防振材
- 4: 冷媒配管としての吸入管
- 5: アキュムレータ
- 6: 冷媒配管としての吐出管
- 9: 可撓管
- 15: 室外機バルブ
- 16: 室外機熱交換器

【特許請求の範囲】

【請求項1】 圧縮機と室外機との間に接続された冷媒配管の途中に可撓管が直列に接続された空気調和機用冷媒配管において、ベローズ状に形成された可撓管の凹凸部及び冷媒配管との溶接部の外面が、上記凹凸部に対応する凹凸部内面と円筒型外面とを有する弾性部材で隙間なく覆われていることを特徴とする空気調和機用冷媒配管。

【請求項2】 可撓管の凹凸部外面に対抗する凹凸部内面を有するスリーブの長手方向に沿った分割体が、上記可撓管の凹凸部外側に嵌着されていることを特徴とする請求項1記載の空気調和機用冷媒配管。

【請求項3】 ベローズ状に形成された可撓管と、緩衝材を隙間なく設け密着されていることを特徴とする請求項1記載の空気調和機用冷媒配管。

【請求項4】 ベローズ状に形成された可撓管と、その外方に間隔を置いて同心的に配設された弾性体のスリーブとの隙間空間へ、外方の弾性体のスリーブより低弾性部材でできた緩衝体を隙間なく設け密着されていることを特徴とする請求項1に記載の空気調和機用冷媒配管。

【請求項5】 ベローズ状に形成された可撓管と、その外方に間隔を置いて同心的に配設された弾性体のスリーブとの隙間空間へ、緩衝体を隙間なく設け密着され、かつ弾性部材の内側あるいは外周部に補強用メッシュを備えたことを特徴とする空気調和機用冷媒配管。

【請求項6】 外方の弾性体のスリーブより低弾性部材でできた緩衝材を隙間なく設け密着させたことを特徴とする請求項5記載の空気調和機用冷媒配管。

【請求項7】 スリーブが断面矩形状で弾性的な方向性を有していることを特徴とする請求項5又は請求項6に記載の空気調和機用冷媒配管。

【請求項8】 圧縮機と切換弁との間に接続された冷媒配管の途中に可撓管が直列に接続された空気調和機において、ベローズ状に形成された可撓管と、その外方に間隔を置いて断面矩形状に配設された弾性体のスリーブとの隙間空間へ、緩衝材を隙間なく設け密着させ、そのスリーブが弾性的な方向性を有していることを特徴とする空気調和機用冷媒配管。

【請求項9】 可撓管とこの可撓管に接続される冷媒配管をロウ付け溶接する際、リング状ロウ材を可撓管にはめ込み装着し、この端部を可撓管に接続される冷媒配管の端部に挿入接続してロウ材を装着固定後、冷媒配管内へ不活性ガスを噴出しながら高周波ロウ付け方法によりロウ付け溶接し、ロウ付け溶接終了後に冷媒配管内に空気を噴出させることを特徴とする空気調和機用冷媒配管の製造方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、空気調和機に係り、特に、空気調和機の室外ユニット用冷媒配管及びそ

の製造方法に関するものである。

【0002】

【従来の技術】一般に空気調和機の室外ユニットの圧縮機及び室外熱交換器と室内熱交換器との接続管、すなわち圧縮機への吸入配管及び圧縮機からの吐出配管部には圧縮機の振動を各熱交換器へ伝達するのを防止する振動吸収部が設けられている。

【0003】図15は例えば、実開昭61-54163号公報に示された従来の配管構造を示す斜視図である。図において、1は圧縮機で、機器の基盤に防振材2を介して弾性的に支持され、その上方に四方弁などの切換弁3が配設されている。4はこの切換弁3と圧縮機1とを結ぶ吸入配管で、途中にはアキュムレータ5を接続している。6は上記圧縮機1と切換弁3とを結ぶ吐出配管、7、8は吸入管及び吐出管で、上記切換弁3と熱交換器（図示されていない）とを接続し、これら各管のそれぞれが圧縮機1の周囲でループ状に折曲されている。

【0004】次に動作について説明する。圧縮機1を駆動させて、冷媒を圧縮して吐出させると、圧縮機1に振動が発生する。このため、この振動が吸入配管4及び吐出配管6を介して伝播され、四方弁などの切換弁3を経て熱交換器まで到達する。しかし、各冷媒配管が圧縮機1の周囲にループ状に折曲しているため、防振作用が行われ振動は、次第に減衰されてくる。

【0005】このような従来の配管構造では、配管に形成されるループが多くなって、配管の長さが長くなって冷媒の振動抵抗が増大するばかりでなく、配管スペースが大きくなり、装置全体が大型化するという問題があった。

【0006】また、配管に形成されるループが多くなるに従って、配管系の固有振動数の数も大きくなり、圧縮機の運転速度によっては、圧縮機の運転速度と配管系の固有振動数が一致した共振状態となり、振動が大きくなって最悪の場合には、配管の破損につながっていた。特に、圧縮機の入力電源の周波数を変化させ、圧縮機の運転速度を変化させる制御をした場合、配管に形成されたループが多いと、共振する周波数も多くなるため配管形状の設計、圧縮機の制御が非常に困難となる。

【0007】このような問題を解決する第二の従来例として、それぞれ軟質の隣脱酸銅管によって成形された可撓管9を設け、この可撓管9に鋳造加工によって外周部に長手方向に沿って蛇腹状に形成したスパイラル状の溝10で、かつ軟質隣脱酸銅管よりも剛性の高い材料によって形成され、上記可撓管9の軸方向ないし長手方向の撓みを許容すると共に、管内圧による径方向への撓みないし変形を規制して可撓管9の耐久性を可及的に高める技術が図16ないし図18に開示されている。

【0008】次に動作について説明する。圧縮機1により圧縮された冷媒は、これに接続された吐出配管6に吐出されて移送される。冷媒を圧縮して吐出配管6及び吸

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入配管 4 を介して四方弁などの切換弁 3 に達し、更に吐出管 8 及び吸入管 7 に伝播されることになるが、上記の如く吐出管 8 及び吸入管 7 には可撓管 9 が介装されているため、この可撓管 9 により振動が吸収される。

【0009】従って、圧縮機 1 からの振動は可撓管 9 で吸収され室外熱交換器（図示されていない）に伝播されることが防止される。可撓管 9 は軟質磷脱酸銅管によって形成され、かつ軸方向に沿って外周部にスパイラル状の溝 10 が設けられ、かつコイルスプリング 11 が遊嵌されているので、軸方向への伸縮を許容し、かつ半径方向への変形を規制して、耐圧強度、疲労強度が増加されて耐久性を向上する。

【0010】また、第三の従来例として、金属製蛇腹からなる可撓管の外周に金網を配設し、さらに、その外側を中央部を薄肉化した筒体で被覆し、振動による金属製蛇腹管の湾曲姿勢を制御し長寿命化を図る技術が、特開昭 63-75453 号公報に開示されている。

【0011】また、図 19 は例えば特開平 4-172175 号公報に示された従来のロウ付け方法を示す斜視図であり、4a はロウ付けする挿入側吸入配管、4b はロウ付けする挿入される側の吸入配管、12 は接続される配管の端部にはめ込まれるリング状ロウ材、13 はこのリング状ロウ材部分を加熱する高周波ロウ付け時の高周波誘導加熱用電極である。

【0012】次に従来のロウ付け方法の作用について説明する。配管 9 の端部にリング状ロウ材 12 をはめ込み、この端部を配管 6b の端部に挿入接続後、この接続部分に加熱電極 13 に近接させ、加熱電極に流れる高周波誘導電流により、接続部分を加熱してロウ材 12 を溶融することにより配管同士を高周波ロウ付けする。

【0013】

【発明が解決しようとする課題】しかしながら、従来の空気調和機用冷媒配管は、図 16 ないし図 18 に示されるように可撓管を軟質磷脱酸銅管であるため、コイルスプリングで補強されていても、空気調和機で使用するには強度が不足し、振動による経時変化で加工硬化が発生し、十分な可撓管を得ることができなくなる。

【0014】また、可撓管に圧力をかけた場合、コイルスプリングによる補強のため、半径方向よりも軸方向に変化する、従って、内圧に対する変形が大きくなる。さらに、空気調和機の配管の振動は本来軸方向よりも曲げ方向の方が大きいにも拘わらず、上記従来例では曲げ振動に対する十分な対策が施されていないため、可撓管の応力増大、破壊が起きるという問題があった。

【0015】また、上記第三の従来例では、可撓管の凹凸部と筒体との間に隙間空間があるため、曲げなどの変形力が働いたときに、蛇腹の谷部又は山部に局部的に応力が集中し、応力の分散が充分に行われ難いという問題点があり、さらに、ゴム筒体の中央部が薄肉化されているため、中央部に何等かの原因で亀裂が入った時に破断

し易くなるので、信頼性の面で万全とはいえなかった。

【0016】また、従来の製造方法は以上のように構成されているので、ロウ付けにより配管が高温となる。よって構成部品にゴムを用いている可撓管等のように熱に弱い配管部品に対して適用できないなどといった問題があった。

【0017】この発明は、上記のような問題を解決するためになされたもので、空気調和機の圧縮機に接続される冷媒配管の振動を十分に吸収し耐圧性、曲げ応力に対する十分な強度を有した冷媒配管をとりつけた空気調和機を定コストで提供することを目的とする。

【0018】また、この発明の製造方法では、熱に弱い可撓管を熱劣化が少なく高品質の冷媒配管とした製造できる方法を得ることを目的とする。

【0019】

【課題を解決するための手段】この発明に係わる空気調和機用冷媒配管は、圧縮機と室外機との間に接続された冷媒配管の途中に可撓管が直列に接続された空気調和機用冷媒配管において、ベローズ状に形成された可撓管の凹凸部及び冷媒配管との溶接部の外面が、上記凹凸部に対応する凹凸部内面と円筒型外面とを有する弾性部材で隙間なく覆およう設けている。

【0020】この発明に係わる空気調和機用冷媒配管は、可撓管の凹凸部外面に対抗する凹凸部内面を有するスリーブの長手方向に沿った分割体が、上記可撓管の凹凸部外側に嵌着して設けている。

【0021】この発明に係わる空気調和機用冷媒配管は、ベローズ状に形成された可撓管と、緩衝材を隙間なく設け密着されている。

【0022】この発明に係わる空気調和機用冷媒配管は、ベローズ状に形成された可撓管と、その外方に間隔を置いて同心的に配設された弾性体のスリーブとの隙間空間へ、外方の弾性体のスリーブより低弾性部材でできた緩衝体を隙間なく設け密着されている。

【0023】この発明に係わる空気調和機用冷媒配管は、ベローズ状に形成された可撓管と、その外方に間隔を置いて同心的に配設された弾性体のスリーブとの隙間空間へ、緩衝体を隙間なく設け密着され、かつ弾性部材の内側あるいは外周部に補強用メッシュを備えたものである。

【0024】この発明に係わる空気調和機用冷媒配管は、外方の弾性体のスリーブより低弾性部材でできた緩衝体を隙間なく設け密着されている。

【0025】この発明に係わる空気調和機用冷媒配管は、スリーブが断面矩形状で弾性的な方向性を有している。

【0026】この発明に係わる空気調和機用冷媒配管は、圧縮機と切換弁との間に接続された冷媒配管の途中に可撓管が直列に接続された空気調和機において、ベローズ状に形成された可撓管と、その外方に間隔を置いて

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断面矩形状に配置されたスリーブとの隙間空間へ、緩衝材を隙間なく設けて密着させ、そのスリーブが弾力的な方向性を有している。

【0027】この発明に係わる空気調和機用冷媒配管の製造方法は、可撓管とこの可撓管に接続される冷媒配管をロウ付け溶接する際、リング状ロウ材を可撓管にはめ込み装着し、この端部を可撓管に接続される冷媒配管の端部に挿入接続してロウ材を装着固定後、冷媒配管内へ不活性ガスを噴出しながら高周波ロウ付け方法によりロウ付け溶接し、ロウ付け溶接終了後に冷媒配管内に空気を噴出させるものである。

【0028】

【発明の実施の形態】

実施の形態 1. 図 1 は、この発明の空気調和機の室外ユニットの圧縮機周辺の冷媒配管を示したものの、図 2 は可撓管の断面を示す拡大図で、14 は空気調和機の室外ユニット基盤で、防振材 2 により圧縮機 1 を弾力的に載置支持している。15 はこの室外ユニットの第一のバルブであり、吸入配管 4 により圧縮機 1 と接続されており、途中にはアキュムレータ 5 と可撓管 9 とを直列に設けている。16 は室外熱交換器であり、圧縮機とは吐出配管 6 により接続されている。17 は上記可撓管 9 のステンレス製のペローズ管で、冷媒配管としての吸入配管 4 に溶接部 18 により接続されている。19 は蛇腹状の凹凸部で、この凹凸部及び上記溶接部 18 の外側にはウレタンゴム等の弾性部材 20 が充填され、かつ密着して、その外側は円筒形のようになめらかに平坦化されている。

【0029】次に動作について説明する。図 1 及び図 2 において、圧縮機 1 と振動はアキュムレータ 5、冷媒配管としての吸入配管 4 を伝わり、可撓管 9 に達する。しかし、その振動は圧縮機 1 に発生した振動に比べてかなり小さくなる。従って、空気調和機の室外ユニットの振動は図 11 に示すように、可撓管 9 を使用していない室外ユニットよりも大幅に低減されることになる。また、可撓管 9 に冷媒が充填されたとき、軸方向の伸びが生ずるが、ステンレス製のペローズ管 17 のみでは変形により、応力集中が起こり、塑性変形、あるいは破壊が生ずるが、可撓管 9 の蛇腹状凹凸部 19 外部に隙間なく設けたウレタンゴムである弾性部材 20 により特定の部分に応力が集中することなく分散され、可撓管 9 の伸びを規制することができる。

【0030】曲げ方向の変形に関しては、上記ウレタンゴムである弾性部材 20 により振動吸収に必要な十分な可撓性が得られる。そのため、流体圧力に対する耐圧性を維持したまま曲げ方向の可撓性により圧縮機 1 の振動を吸収する。また、ウレタンゴムである弾性部材 20 の内部減衰により振動時の振動減衰比も上がり、可撓管 9 に振動減衰器を取り付けたのと同様な効果を得る。そのため、この発明の実施の形態 1 では冷媒配管の長さを短

縮でき、しかも冷媒配管を配設するスペースを小さくできるため、室外ユニットの小型化が可能となる。さらに、溶接部 18 もウレタンゴムである弾性部材 20 でカバーされているため、外気の水分その他寿命を短縮する物質から溶接部 18 を遮断し、腐食などを防ぐことができる。

【0031】この発明の実施の形態 1 では、吸入配管に可撓管を仕様しているが、吐出配管または吐出配管と吸入配管の両方に可撓管を直列に接続してもよい。さらに、弾性部材としてウレタンゴムを仕様しているが、スチレンゴム、又はシリコンゴム等を用いても同様の効果を得ることができる。

【0032】実施の形態 2. 図 3 及び図 4 はこの発明の実施の形態 2 を示す可撓管の分解側面図及び概略を示す側面図である。20a はゴム製のスリーブの長手方向に沿って分割した 2 分割体で、ステンレス製のペローズ状の可撓管 9 凹凸部 19 外側、及び冷媒配管としての吸入配管 4 との溶接部 18 の外面に上記凹凸部 19 に対抗する凹凸部 19 内面を有し、凹凸部 19 外側に隙間なく密着状態に嵌着されている。

【0033】次に動作について説明する。可撓管 9 に冷媒が充填され、内圧が加えられた場合に、可撓管 9 の軸方向の伸びがゴム製のスリーブ、例えば、弾性部材であるウレタンゴム 20 により抑えられ、また可撓管 9 の応力が特定の部分に集中せず分散され、可撓管 9 の耐圧性を上げることができる。また、振動による応力も弾性部材であるウレタンゴム 20 により、分散され振動による応力集中を回避し、破壊を防止することができる。また、ウレタンゴムである弾性部材 20 の内部減衰により振動時の振動減衰比も上がり、可撓管に振動減衰器をつけた場合と同様の効果がある。そのため冷媒配管の長さを短縮でき、しかも冷媒配管を配設するスペースが小さくすみ、ユニットの小型化が可能となると共に、分割体は金型により安価に量産でき、組み付け作業も簡単でコストを下げる効果を有する。

【0034】この実施の形態 2 では、弾性部材としてウレタンゴムを仕様しているが、スチレンゴム、ニトリルゴム、クロロブレンゴム、又はシリコンゴム等を用いても同様の効果を得ることができる。また、分割体は 3 分割または 4 分割体でもよい。

【0035】さらに、この実施の形態 2 では、吸入配管に可撓管を仕様しているが、吐出配管または吐出配管と吸入配管との両方に可撓管を直列に接続しても良い。さらにまた、この発明の実施の形態 2 では、外側が円筒形のもの仕様しているが、蛇腹でもよいことは、勿論である。

【0036】実施例 3. 図 5 はこの発明の実施の形態 3 の可撓管の概略を示す側面図、図 6 はこの可撓管の製造工程を示す説明図である。図 6 において冷媒配管として吸入配管 4 に溶接されたステンレス製の可撓管 9 に、予

め可撓管9の外径よりも大きい、例えばニトリルゴム製のスリーブ21を同心的に配設し、可撓管9とニトリルゴム製のスリーブ21との隙間空間に緩衝材、例えば液状のウレタンゴム20に鎖延長剤及び架橋剤を混合した原料を注入し、硬化させると図5に示す如く、ニトリルゴム製のスリーブ21との隙間空間にウレタンゴムである弾性部材20の充填物が隙間なく設けたものが得られる。

【0037】次に動作について説明する。可撓管9に冷媒が充填され、内圧が加わった時に、可撓管9の伸びがニトリルゴム製スリーブ21及びウレタンゴムである弾性部材20により抑えられ、また、可撓管9の応力が特定部分に集中せず分散され、可撓管9の耐圧を上げることができる。また、振動による応力もウレタンゴムである弾性部材20及びニトリルゴム製のスリーブ21によって分散され、振動による応力集中、破壊を防ぐことができる。さらに、ウレタンゴムである弾性部材20及びニトリルゴム製スリーブ21を仕様することにより、振動吸収に必要な可撓管9を補強することができる。さらにまた、ウレタンゴムである弾性部材20及びニトリルゴム製スリーブ21の内部減衰により振動時の振動減衰比もあがり、可撓管9に振動減衰器を取り付けたのと同様の効果を得る。そのため冷媒配管の長さを短くでき、しかも冷媒配管を配設するスペースが小さくて済むため、ユニットの小型化が可能となる。

【0038】また、この発明の実施の形態3では、可撓管の形状、寸法に合わせて液状のウレタンゴムの注入によってウレタンゴムの充填物を得ることができるので、大きな金型を必要とすることなく、端末シール部材を用いて製造でき、かつ耐圧、振動吸収性にすぐれた低コストの可撓管を得ることができ、よって、低コストの空気調和機を提供することができる。

【0039】さらに、この発明の実施の形態3では、ウレタンゴム、ニトリルゴムを仕様しているが、スチレンゴム、クロロブレンゴム、ブチルゴム、又はシリコンゴムに置き換えても同様の効果を得ることができる。

【0040】実施の形態4。上記実施の形態3では、可撓管とその外方に間隔をおいて同心的に配設されたニトリルゴム製のスリーブ21との隙間空間にウレタンゴムの充填物で形成してあるが、特にニトリルゴム製スリーブ21の硬化をウレタンゴム20硬度よりも硬く設定したのがこの発明の実施の形態4で、通常のゴム硬度は、50～80度の範囲で選択されている。

【0041】これにより、ニトリルゴム製スリーブ21で可撓管9の圧力負荷時の変形を規制し耐圧力を上げることができる。また、内部に注入されたウレタンゴム20で振動吸収性を良くすることができる。さらに、使用条件により、ニトリルゴム製スリーブ21と内部に注入されるウレタンゴム20の硬度の比率を適宜選択することにより、幅広い条件で使用できる。

【0042】実施の形態5。上記実施の形態3あるいは実施の形態4では、ステンレス製の可撓管9とその外方に間隔をおいて同心的に配設されたニトリルゴム製スリーブ21は、円筒状底なしタイプのものであるが、図7に示すように可撓管9と底付きニトリルゴム製スリーブ21aとの隙間空間にウレタンゴムである弾性部材20の充填物を隙間なく設けて形成してある。

【0043】この発明の実施の形態5では、端末シール部材を廃止することができるので、生産工程が少なくなり、低コストの可撓管を得ることができ、かつ低コストの空気調和機を提供することが可能となる効果を有するものである。

【0044】実施の形態6。図8は、この実施の形態6の可撓管の概略を示す側断面図である。図8に示すように、冷媒配管として吸入配管4に溶接されたステンレス製の可撓管9に、予め可撓管9の外径よりも大きく内側がメッシュ、例えばゴム製のメッシュ22で補強されたニトリルゴム製スリーブ21を同心的に配設し、可撓管9とニトリルゴム製スリーブ21の隙間空間に弾性部材である液状のウレタンゴム20に鎖延長剤および架橋剤を混合した原料を注入して硬化させると、ニトリルゴム製スリーブ21と可撓管9との隙間空間にウレタンゴムである弾性部材20の充填物が隙間なく設けてたものが得られる。

【0045】次に動作について説明する。可撓管9に冷媒が充填され、内圧が加わった時に可撓管9の伸びがゴム製のメッシュ22で補強されたニトリルゴムにより抑えられ、また、可撓管9の特定部分に応力が集中せず分散され、可撓管9の耐圧性を向上することができる。さらに、ニトリルゴム製のスリーブ21はゴム製のメッシュ22で補強されているので、実施の形態3、実施の形態4のニトリルゴム製のスリーブ21とウレタンゴム20を組み合わせた構造よりも、さらに高い耐圧性を得ることができる。

【0046】また、振動による応力もウレタンゴム20によって分散され、振動による応力集中、破壊を防ぐことができる。さらに、ウレタンゴム20の内部減衰により振動時の振動減衰比もあがり、可撓管9に振動減衰器をつけた場合と同等の効果がある。そのため冷媒配管の長さを短縮でき、しかも冷媒配管を配設するスペースが小さくてすみ、ユニットの小型化が可能となる。又、この実施の形態6では可撓管9の形状、寸法に合わせて液状のウレタンゴム20の注入によってウレタンゴム20の充填物を得ることができ、大きな金型を必要とすることなく製造できるので、耐圧、振動吸収性に優れた低コストの可撓管を得ることができ、かつ低コストの空気調和機を提供することができる。

【0047】実施の形態7。図9は、この実施の形態7の可撓管の一部を構成しているニトリルゴム製スリーブの概略を示す斜視図である。23は断面矩形形状のニト

リルゴム製のスリーブで、実施の形態3、4、5、あるいは実施の形態6での可撓管9とその外方に間隔をおいて、同心的に配設されたニトリルゴム製スリーブ21と違い弾性的な方向を有している。

【0048】次に動作について説明する。圧縮機の振動は接続方向の振動を1とすると、法線あるいは上下方向の振動は約0.05と無視できるくらい小さい。このように1つの方向のみ可撓性を持っていれば、圧縮機1に発生した振動は減衰され、空気調和機の室外ユニットの振動は、図13に示すユニット振動レベル比較に明らかなような効果が得られ、可撓管を使用していない室外ユニットよりも大幅に低減できる。また、圧縮機の振動を十分に吸収できるだけの可撓性を必要な方向に持っていれば良いので、輸送中などの外乱の振動を受けた場合、この実施の形態7の構成をもっていれば、不必要な振動を抑えることができるので、他の冷媒配管部品に与える影響を少なくでき、かつ室外ユニットの信頼性の向上を図ることができる。

【0049】また、可撓管9に冷媒が充填されたとき、軸方向の伸びが生ずるが、ステンレス製の可撓管9のみでは変形により、応力集中が起こり、塑性変形、あるいは破壊が生ずる。しかし、可撓管9の凹凸部17外部に隙間なく設けたウレタンゴム20により特定の部分に応力が集中することなく分散され、可撓管9の伸びを規制することができる。曲げ方向に関しては、上記ウレタンゴム20により振動吸収に必要な充分な可撓性が得られる。そのため耐圧性を維持したまま曲げ方向の可撓性により圧縮機1の振動を吸収する。

【0050】実施の形態8。図10は、空気調和機の室外ユニットの圧縮機周辺の冷媒配管図、図11は、図10の上面図であり、図12(a)は、この実施の形態8の可撓管を示す断面図。図12(b)はこの実施の形態8の可撓管の概略を示す側面図である。図において、14は空気調和機の室外ユニット基盤で、防振材2により圧縮機1を弾性的に載置支持していると共に、圧縮機1とは吸入配管4により途中にアキュムレータ5を介して四方弁などの切換弁3と接続されている。また、圧縮機1と四方弁などの切換弁3とは吐出配管6により接続されている。さらに、四方弁などの切換弁3には図示されていない熱交換器に接続される吸入管7および吐出管8が接続されている。17は上記可撓管9のステンレス製のベローズ管で、冷媒配管としての吸入配管4に溶接部18により接続されている。19は蛇腹上の凹凸部、23は上記ステンレス製ベローズ管17により形成された可撓管9を包み込むように配設した断面矩形状のニトリルゴム製スリーブで、圧縮機1の接続方向を短く、かつ法線方向を長く成すと共に、一方に閉塞面23cを形成して可撓管9の蛇腹状凹凸部19との隙間には隙間なく弾性部材であるウレタンゴム20が充填して設けている。

【0051】次に動作について説明する。圧縮機1の振動はアキュムレータ5を伝わり、可撓管9に達する。圧縮機1の振動は図11に示すように接線方向、即ち圧縮機1の振動大の方向の振動を1とすると、法線あるいは上下方向、即ち圧縮機の振動小の方向の振動は約0.05と無視できるくらい小さいので、aの矢印方向は可撓性大の方向、bの矢印方向は可撓性小の方向となり、1つの方向のみ可撓性を持っていれば、圧縮機1に発生した振動は減衰され、空気調和機の室外ユニットの振動は、図13に示すユニット振動レベル比較表とほぼ同様な効果が得られ可撓管を使用していない室外ユニットよりも大幅に低減できる。

【0052】したがって、この発明の実施の形態8では圧縮機と四方弁などの切換弁との間に接続された冷媒配管の途中に可撓管が直列に接続され、かつ圧縮機に接続方向、即ち圧縮機の振動大の方向を断面矩形状の短手とし、圧縮機の法線あるいは上下方向、即ち、圧縮機の振動小の方向を断面矩形状の長手として配設されているので、スリーブ自身が弾性的な方向を有しているから、必要な方向の曲げの可撓性を失うことなく可撓管を補強でき、耐圧性、曲げ応力に対する強度、振動吸収性を良好にすると共に、冷媒配管の長さを短縮でき、しかも冷媒配管を配設するスペースを小さくできるため、ユニットの小型化が可能となる効果を有する。

【0053】さらに、可撓管の形状、寸法に合わせて液状のウレタンゴムの注入によってウレタンゴムなどの弾性部材である充填物を得ることができるので、大きな金型を必要とすることなく、端末シール部材を用いて簡単に製造することができ、耐圧性、振動吸収性に優れた可撓管を低コストで得ることができ、低コストの空気調和機を提供する効果を有するものである。

【0054】また、この発明の実施の形態8では、圧縮機の振動を十分に吸収できるだけの可撓性を必要な方向に持っていれば良いので、輸送中などの外乱の振動を受けた場合、不必要な振動を抑えることができるので、他の冷媒配管部品に与える影響を少なくでき、かつユニットの信頼性の向上を図ることができる。

【0055】さらに、この発明の実施の形態8では、吸入配管の一部に可撓管を使用しているが、吐出配管または吐出配管と吸入配管の両方に可撓管を直列に接続してもよい。

【0056】実施の形態9。以下、この発明の実施の形態9を図について説明する。図14において、9は上記実施の形態1ないし実施の形態8による可撓管、4はこの可撓管9に接続される配管、12は上記可撓管9の端部にはめ込まれるリング状口ウ材、13は高周波口ウ付け時の高周波誘導加熱用電極、24は配管内に不活性ガスを噴出する不活性ガスノズル、25は高周波口ウ付け終了後に可撓管9に向けて冷却空気を噴出する空気ノズルである。可撓管9は、外観上は円筒状のゴム部20a

の両端に吸入配管 4 が取り付けられた形状となっており、ゴム部 20a が熱に対して特に弱い。

【0057】以下、作用について説明する。まず、リング状ロウ材 12 を可撓管 9 両端の吸入配管 4 の挿入側 4a 端部にはめ込む。この端部を挿入される側の吸入配管 4b の端部に挿入接続する。この時、リング状ロウ材 12 は吸入配管 4b の端面に当たるように固定する。次に、接続した吸入配管 4a、4b を高周波誘導加熱電極 13 に配置する。この時、配管挿入接続部の周囲に高周波誘導加熱電極 13 が配置されるようにする。

【0058】次に、吸入配管 4 内に不活性ガスが噴出できるように不活性ガスノズル 24 を配置する。まず、不活性ガスを噴出し、不活性ガスが配管内に充満した状態とする。これにより、可撓管 9 内側表面の熱による酸化を防止する。そして、高周波誘導加熱電極 12 で高周波加熱する。これにより、可撓管 9 と吸入配管 4 の接続部分のみ局部的に加熱されるため、ゴム部 20a が加熱されることなくロウ付けされる。

【0059】ロウ付け終了後、直ちに冷却空気ノズル 25 から、可撓管 9 の吸入配管 4 に向けて配管が冷却されるまで空気を噴出する。これによりロウ付けされた可撓管 9 と吸入配管 4 の接続部分から弾性部材 20 への熱の移動を少なくし、可撓管 9 を保護する。

【0060】実施の形態 10。また、上記実施の形態 9 では可撓管 9 のロウ付けについて説明したが、熱に対して弱い機器のロウ付けについても上記実施の形態 9 と同様の効果を奏する。また、高周波誘導加熱工程が自動化することにより、ロウ付けのばらつきの少なくすることができる。

【0061】実施の形態 11。さらに、実施の形態 9 ではリング状ロウ材 12 を可撓管 9 の吸入配管 4a 端部にはめ込み、この吸入配管 4a 端部を吸入配管 4b の端部に挿入接続しているが、可撓管 9 の挿入側配管 4a と挿入される側の配管 4b が反対に接続される構造となっても上記実施の形態 9 と同等の効果を奏する。

【0062】

【発明の効果】以下、この発明の請求項 1 に係る空気調和機用冷媒配管は、圧縮機と室外機との間に接続された冷媒配管の途中に可撓管が直列に接続された空気調和機用冷媒配管において、ベローズ状に形成された可撓管の凹凸部及び冷媒配管との溶接部の外面が、上記凹凸部に対応する凹凸部内面と円筒型外面とを有する弾性部材で隙間なく覆われている構成としたので、可撓性を失うことなく可撓管を補強し、耐圧曲げ応力に対して強度、振動吸収性を良くし冷媒配管の長さを短くできると共に、溶接部に腐食等が発生しにくくなる効果を有する。

【0063】この発明の請求項 2 に係る空気調和機用冷媒配管は、可撓管の凹凸部外面に対抗する凹凸部内面を有するスリーブの長手方向に沿った分割体が、上記可撓管の凹凸部外側に嵌着されている構成としたので、凹凸

部内面を有するニトリルゴム製のパイプの長手方向に沿った分割体は、生産性が高く、組付け作業も簡単であるので、製造コストを引き下げる効果を有する。

【0064】この発明の請求項 3 に係る空気調和機用冷媒配管は、ベローズ状に形成された可撓管と、緩衝材を隙間なく設け密着されている構成としたので、可撓管の形状、寸法に合わせて緩衝材を設けることができるので、耐圧性、振動吸収性にすぐれた可撓管を生産性を高めて低コストで得る効果を有する。

10 【0065】この発明の請求項 4 に係る空気調和機用冷媒配管は、ベローズ状に形成された可撓管と、その外方に間隔を置いて同心的に配設された弾性体のスリーブとの隙間空間へ、外方の弾性体のスリーブより低弾性部材でできた緩衝体を隙間なく設け密着されている構成としたので、弾性体のスリーブより低弾性の緩衝体の充填物を得ることができるとともに、耐圧性、振動吸収性にすぐれ、かつ生産性を高めて低コストの可撓管を得る効果を有する。

20 【0066】この発明の請求項 5 に係る空気調和機用冷媒配管は、ベローズ状に形成された可撓管と、その外方に間隔を置いて同心的に配設された弾性体のスリーブとの隙間空間へ、緩衝体を隙間なく設け密着され、かつ弾性部材の内側あるいは外周部に補強用メッシュを備えた構成としたので、可撓性を失うことなく、可撓管を補強し、耐圧性、曲げ応力に対する強度特性、振動吸収性を良くし、冷媒配管の長さを短縮でき、くかも冷媒配管を配設するスペースを小さくし、ユニットの小型化を可能にする効果を有する。

30 【0067】この発明の請求項 6 に係る空気調和機用冷媒配管は、外方の弾性体のスリーブより低弾性部材でできた緩衝体を隙間なく設け密着されている構成としたので、弾性体のスリーブより低弾性の緩衝体の充填物を得ることができるとともに、耐圧性、振動吸収性にすぐれ、かつ生産性を高めて低コストの可撓管を得る効果を有する。

40 【0068】この発明の請求項 7 に係る空気調和機用冷媒配管は、スリーブが断面矩形状で弾性的な方向性を有している構成としたので、輸送中などの外乱の振動を受けた場合でも、不必要な振動を抑えることができ、他の冷媒配管部品に与える影響を少なくでき、かつ室外ユニットの信頼性の向上を図ることができる。

50 【0069】この発明の請求項 8 に係る空気調和機用冷媒配管は、圧縮機と四方弁との間に接続された冷媒配管の途中に可撓管が直列に接続された空気調和機において、ベローズ状に形成された可撓管と、その外方に間隔を置いて断面矩形状に配置されたスリーブとの隙間空間へ、緩衝材を隙間なく設け密着させ、そのスリーブが弾性的な方向性を有している構成としたので、スリーブ自身が弾性的な方向を有しているから、必要な方向の曲げの可撓性を失うことなく可撓管の補強ができ、耐圧性振

動吸収性を良好にし、冷媒配管の長さを短縮し、しかも冷媒配管を配設するスペースを小さくできるため、ユニットの小型化を可能にする効果を有する。

【0070】この発明の請求項9に係る空気調和機用冷媒配管の製造方法は、可撓管とこの可撓管に接続される冷媒配管をロウ付け溶接する際、リング状ロウ材を可撓管にはめ込み装着し、この端部を可撓管に接続される冷媒配管の端部に挿入接続してロウ材を装着固定後、冷媒配管内へ不活性ガスを噴出しながら高周波ロウ付け方法によりロウ付け溶接し、ロウ付け溶接終了後に冷媒配管内に空気を噴出する方法としたので、熱に対して弱い可撓管を熱からまもり、熱劣化を少なくさせると共に、ばらつきが少ない状態でロウ付け溶接をして製造できる効果がある。

【図面の簡単な説明】

【図1】 この発明の実施の形態1による空気調和機用冷媒配管を示す概略斜視図。

【図2】 この発明の実施の形態1による可撓管を示す側断面図。

【図3】 この発明の実施の形態2による可撓管を示す分解斜視図。

【図4】 この発明の実施の形態2による可撓管を示す側断面図。

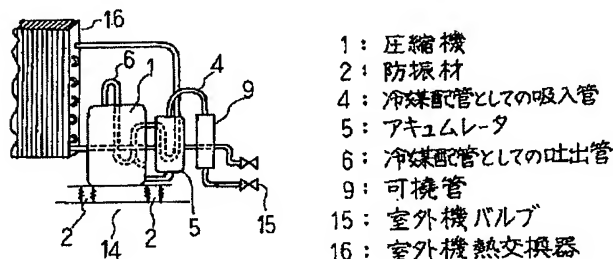
【図5】 この発明の実施の形態3または実施の形態4による可撓管を示す側断面図。

【図6】 この発明の実施の形態3による可撓管の製造に管する説明図。

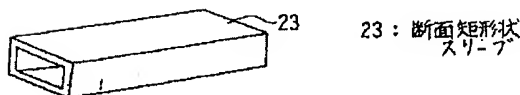
【図7】 この発明の実施の形態5による可撓管を示す側断面図。

【図8】 この発明の実施の形態6による可撓管を示す*30

【図1】



【図9】



* 側面図。

【図9】 この発明の実施の形態7による可撓管のスリーブを示す斜視図。

【図10】 この発明の実施の形態8による空気調和機用冷媒配管を示す要部側面図。

【図11】 図10の空気調和機用冷媒配管を示す上面図。

【図12】 aはこの発明の実施の形態8による可撓管を示す正面図。bはこの発明の実施の形態8による可撓管を示す要部側面図。

【図13】 この発明の実施の形態1を用いた場合のユニット振動レベル比較を示す関係図。

【図14】 この発明の実施の形態9を示す空気調和機用冷媒配管のロウ付け状態の正面図。

【図15】 この発明の第一の従来例による空気調和機を一部切り欠いて冷媒配管を示す斜視図。

【図16】 この発明の第二の従来例による空気調和機を一部切り欠いて冷媒配管を示す斜視図。

【図17】 この発明の従来例による可撓管を示す側面図。

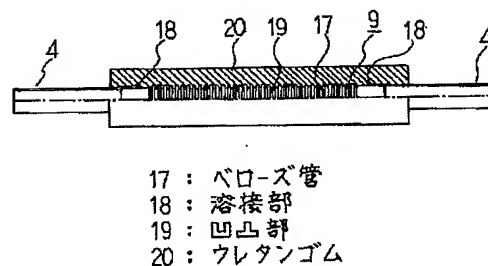
【図18】 図17の可撓管の要部を示す側断面図。

【図19】 従来のロウ付け方法を示す斜視図。

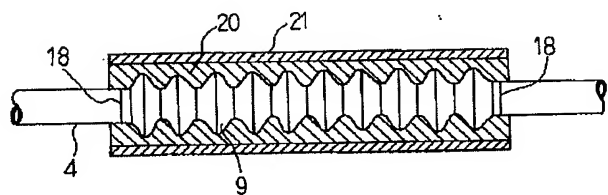
【符号の説明】

1 圧縮機、3 切換弁、9 可撓管、12 リング状ロウ材、13 高周波誘導加熱用電極、17 ベローズ管、18 溶接部、19 凹凸部、20 弾性部材、21 ニトリルゴム製スリーブ、22 メッシュ、23 断面矩形状スリーブ、24 不活性ガスノズル、25 空気ノズル、

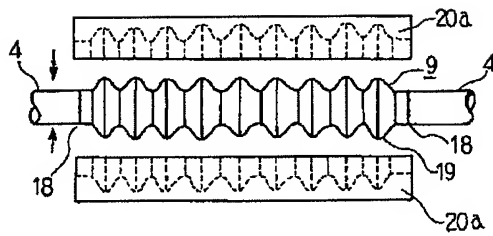
【図2】



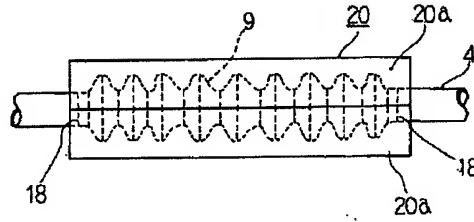
【図5】



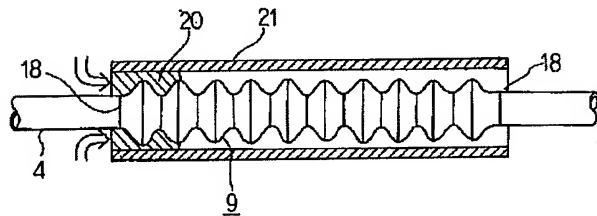
【図3】



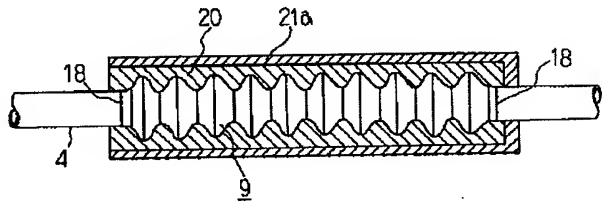
【図4】



【図6】

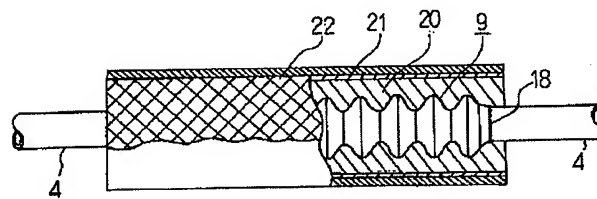


【図7】

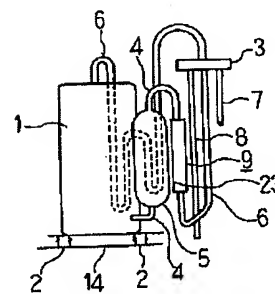


21a: 底付きニトリルゴム製スリーブ

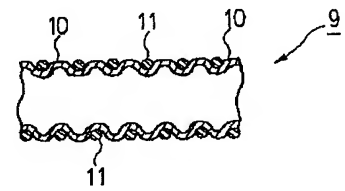
【図8】



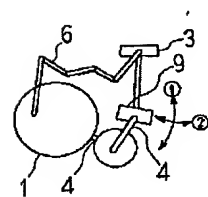
【図10】



【図18】

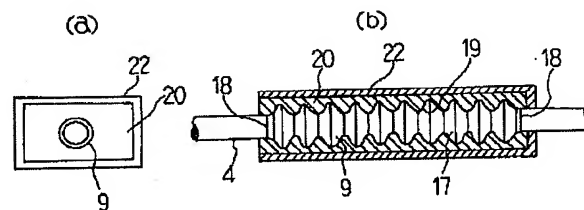


【図11】



- ① 圧縮機の振動大の方向
= 可撓性大の方向
- ② 圧縮機の振動小の方向
= 可撓性小の方向

【図12】

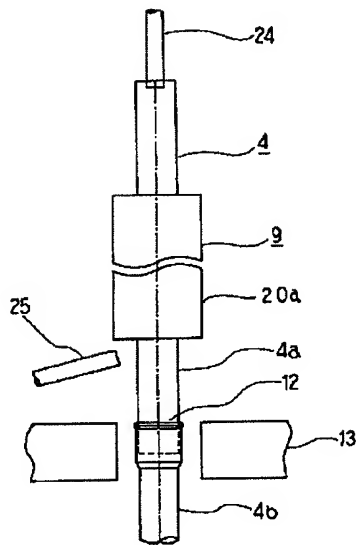


【図13】

ユニット振動レベル比較(比率)

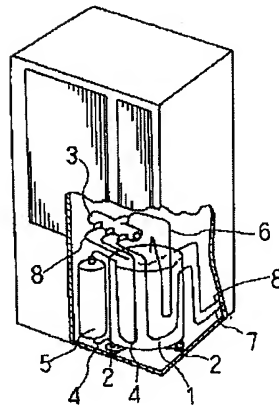
	起動	運転中	停止	配管長
可撓管無	1	1	1	1
可撓管有	0.8	0.6	0.6	0.5

【図14】

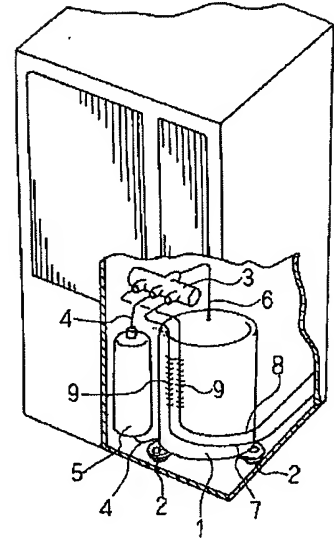


- 12 : リング状ロ-材
 13 : 高周波誘導加熱用電極
 24 : 不活性ノズル
 25 : 空気ノズル

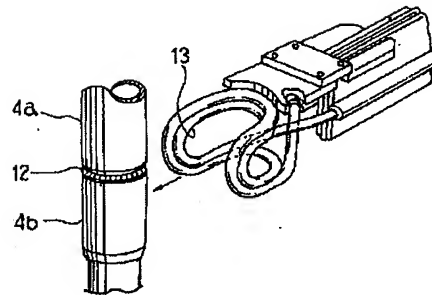
【図15】



【図16】



【図19】



【図17】

